

Final Report

FATALITY OF DECK CADET ONBOARD SRS BAO SUCCESS AT SEA ON 25 NOVEMBER 2022

TIB/MAI/CAS.134

Transport Safety Investigation Bureau
Ministry of Transport
Singapore

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The Transport Safety Investigation Bureau of Singapore

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SYNOPSIS

On 12 November 2022, while at sea, the Fitter onboard the SRS Bao Success was tasked in the morning to carry out some repairs inside No. 5 cargo hold with the assistance of a deck cadet. To assist the Fitter, the deck cadet was positioned on deck, predominantly outside the cargo hold. During this repair process, which lasted him being on deck for about 40 minutes (in two parts of 20 minutes each), the deck cadet reportedly inhaled some fumes from the vent of a fuel tank that was in the same location and felt unwell.

The deck cadet retired to his cabin after reporting to the Chief Officer of a headache, who in turn advised the Master. The deck cadet was instructed to take rest and meals were arranged for him in the cabin. Over the next few days, the deck cadet's appetite was poor, and his condition worsened for medical advice ashore to a Company doctor. The deck cadet's condition worsened as he started having dizziness, vomiting and diarrhoea. Subsequently the vessel's course was diverted for the deck cadet to receive medical attention from shore, however the deck cadet was discovered unconscious on his bed with his feet bent inwards and palms clasped. Attempts to resuscitate the deck cadet were unsuccessful and he was declared dead.

The Transport Safety Investigation Bureau classified the occurrence as a very serious marine casualty.

The autopsy conducted on the deck cadet revealed the cause of death to be Asphyxia due to aspiration of stomach content. The investigation revealed that the inexperienced deck cadet had not worn any respiratory mask for the duration he was assisting the Fitter. Although the deck cadet was given rest in his cabin and given a light diet, his vital signs were not monitored, and he had not been administered medical oxygen.

The investigation also revealed that Master and the Chief Officer did not put their training on Medical Care onboard ship into practice and relied on advice of the crewing manager ashore. Although the Company sought some advice from their doctor, there was no advice sought from a coast radio station in accordance with the Company's SMS procedures. The deck cadet's condition was mistaken to be a result of seasickness which resulted in a delay to deviate for seeking shore medical attention.

DETAILS OF VESSEL

Name	Bao Success
IMO number	9482029
Flag registry	Singapore
Classification society	Bureau Veritas (BV) ¹
Ship type	Cargo Ship - Bulk Carrier
Hull	Steel
Delivery	21 April 2009
Owner/ ISM Manager ²	Bao Success Shipping Ltd. / HTM Shipmanagement Co. Ltd, China
Gross tonnage	32945
Length overall	189.998m
Moulded breadth	32.26m
Moulded depth	18.00m
Summer draught Actual mean draught	12.80m 11.40m
Service speed (loaded)	About 13.5 knots



Bao Success

¹ As per the international management code for the safe operation of ships and for pollution prevention – ISM Code, BV was the Recognised Organisation (RO) for carrying out ISM audit and issuance of ISM related certificates, as well as for survey and issuance of other statutory certificates.

² The “ISM Manager” is referred to as the Company in this investigation report.

1 **FACTUAL INFORMATION**

All times used in this report are ship's mean time of Bao Success which was three hours ahead of the UTC (UTC+3), unless otherwise stated.

1.1 **Sequence of events**

1.1.1 On 12 November 2022, when the vessel was at sea, off the western coast of Africa, the Fitter was tasked to carry out some repairs³ inside No. 5 cargo by the Chief Officer (CO). At about 0800H, the Fitter together with a deck cadet (DC) prepared the items needed for the repair at the main deck on the port side at No. 5 cargo hold, i.e. oxygen-acetylene hoses for carrying out welding.

1.1.2 While the Fitter and DC waited at no. 5 cargo hold, near the ventilator (vent) for the bunker (heavy fuel oil - HFO) tank⁴ (located near the entrance of the cargo hold), the Bosun opened the hatch cover for No. 5 cargo hold. This process took about 15 to 20 minutes. According to the Fitter, both noticed that there was a strong smell of fumes from the vent (No. 2 HFO tank Port) and that the DC informed the Fitter that he did not like the smell. The Fitter told the DC that the job should not take very long, and they can finish it quickly for the day.

1.1.3 The Fitter then instructed the DC to pass the hoses and the equipment (bucket with tools) into the cargo hold once Fitter had entered⁵ the hold. After the Fitter had entered the cargo hold, the DC commenced lowering the equipment while reportedly standing on the raised steps aft of the HFO tank vent (about 3.5m) on the main deck. This process took about 15 to 20 minutes according to the Fitter.

1.1.4 At about 0910H, the DC also entered the cargo hold to assist the Fitter. Both exited No. 5 cargo hold at about 1115H to break for the day. The tools were left behind inside, and the hatch-cover was partially closed. The DC reportedly informed the Fitter that he was not feeling too well and would rest and did not intend to have dinner.

1.1.5 The next day on 13 November 2022, when the CO was about to go on deck for his rounds, he saw the DC return from the deck and was told by the latter that he was not feeling well. He further informed the CO that he had a headache

³ As a result of some damage during cargo operations at the previous port.

⁴ For no. 2 Port bunker tank.

⁵ Prior entry the fitter reportedly informed the DC that he would finish the job quickly.

because of inhaling some fumes (referred to the HFO vapour from No. 2 HFO tank Port) the previous day. The CO advised the DC to rest and advised the Master of the DC's condition later that afternoon, during the navigation watch at about 1600H.

- 1.1.6 The Master went to the DC's cabin on the same day, and recalled the same being reported by the DC, i.e. headache. The Master too advised the DC to take rest. The Master and the CO visited the DC occasionally and made phone calls to his cabin to check on his well-being. For the next few days, according to the Master, the DC was able to go to the mess room for taking his meals⁶ until 18 November 2022. The Master noted that the DC's food consumption had reduced. During this period the DC reportedly had diarrhoea which lasted for about three days from 12-14 November 2022.
- 1.1.7 The Master reportedly encouraged the DC to eat more food to gain more energy and to leave the cabin for some fresh air. The Master also assessed that other than the complaint of headache, the DC appeared normal – talking normally. The Master instructed the CO to give only light duties to the DC to avoid him lying on bed / sofa in his cabin all the time. On 15 November 2022 from 1400H to 1700, the Master conducted emergency drills⁷ onboard which were attended by all crew.
- 1.1.8 The investigation team sighted a WeChat⁸ communication between the CO⁹ and the crewing manager on 18 November 2022, which gave a brief background of the DC having inhaled HFO vapour, requesting for medical advice. The crewing manager advised the CO to give light food to the DC, such as mixed noodles and informed the General Manager accordingly.
- 1.1.9 A similar communication was also sighted between the crewing manager and a medical professional (addressed as "Dr."¹⁰ in the chat) for the same day. The Dr., in a call that lasted about two minutes with the crewing manager, reportedly advised for the DC to be placed on a light diet. It could not be established whether any further communication took place between the Dr. and the vessel

⁶ According to the Chief Cook, who was the only galley staff onboard, the meals consumed by the DC were similar to the rest of the other crew, i.e., three dishes with rice and / or soup. When asked, the quantity of meals consumed by the DC was not specifically monitored by the Chief Cook.

⁷ Man-overboard, Fire drill, Abandon ship drill, Pollution prevention and Enclosed Space entry drill.

⁸ A communication media popularly used in China.

⁹ According to the Company's SMS, the CO is the medical officer onboard.

¹⁰ According to the Company, this was a medical practitioner from Tongji Hospital in Shanghai, who was contacted by the crewing manager.

thereafter. The same day all crew reportedly (including the DC) participated in a safety meeting and training session (unrelated matter) which lasted for about two hours.

- 1.1.10 On or around 20 November 2022, the vessel was sailing close to the Cape of Good hope (South of South Africa) and the sea condition was choppy and rough¹¹. Many crew onboard were seasick. Fearing that the DC could be prone to falls, the Master advised the DC not to leave his cabin to have meals in the mess room. Instead, the Master instructed one able seafarer deck (ASD) to bring dinner to the DC to his cabin. Over the next few days, the ASD brought food to the DC's cabin and cleared the plates thereafter.
- 1.1.11 On 23 November 2022, according to the Master, the DC appeared more tired and sleepy and had eaten lesser food as compared to the previous days. The next day, noting that the DC had no further appetite, the Master brought four packets of milk (300ml), of which the DC consumed two packets in quick succession. Thereafter the Master instructed the Chief Cook to prepare porridge for the DC.
- 1.1.12 On the morning of 24 November 2022, the Master informed the crewing manager of the DC's condition using WeChat communication. In that communication the Master asked if the DC could be signed off, citing that the DC had been having dizziness, vomiting and diarrhoea. The Master further added that DC could be suffering from gas poisoning¹² and signing off the DC in Mauritius (ETA 28 November 2022) should be considered. The Company also initiated communication with the agents in the port of Toluguaro, Madagascar with an ETA of 25 November 2022 to disembark the DC for medical attention and the Master diverted the vessel's course accordingly.
- 1.1.13 The investigation team sighted a similar communication between the crewing manager and the (same) Dr. which suggested for the DC to be given Omeprazole¹³, in addition to having glucose or milk without sugar. The doctor further stated that passing urine is important and that DC should be hydrated.
- 1.1.14 The crewing manager then enquired from the Master using WeChat if the

¹¹ BF 6/7.

¹² Translated.

¹³ Typically used to treat various conditions of the gastrointestinal tract including gastro-oesophageal disease (acid reflux where the acid from the stomach goes up the food tube and throat causing pain and heartburn. (Source: Healthhub.sg)

- vessel had Omeprazole (as advised by the Dr.) in the ship's medicine chest¹⁴. The Master sent a copy of the list of medicines onboard to the crewing manager who stated that this medication was not in the list. The subsequent advice by the crewing manager was to give him some sugar water (glucose)¹⁵ or milk without sugar.
- 1.1.15 The crewing manager also advised for the DC to be encouraged to take fresh air at least twice a day and be observed. Meanwhile the advice to the Master was to arrange soft food for the DC consisting of poached eggs and noodles which are easy to digest. The Master responded that DC was not convinced to eat some food and reportedly rejected any suggestions. Subsequent messages indicated that the sign-off for the DC had been arranged in Mauritius but efforts were concurrently made for the DC to seek medical attention at Madagascar.
- 1.1.16 The crewing manager then instructed the Master to arrange for the Second Officer to accompany the DC at the time of sign-off, to promote the Third Officer as Second Officer and that the Company would arrange for another Third Officer to join the ship to comply with the Minimum Safe Manning requirements. Concurrently, the Master was advised to ask the DC to speak to his family members who could persuade him to eat some food, noting that the urine passed by DC was very little and yellow in colour.
- 1.1.17 At around 1800H, after having his own dinner, the Master went to the DC who was resting on the sofa in his cabin and enquired if he wanted to eat anything (milk or porridge). The Master gave him another packet of milk and then fed him some porridge. The DC nearly finished the whole bowl¹⁶ of porridge. The Master then helped the DC to lie down on the bed.
- 1.1.18 The Master instructed the CO to arrange for another deck cadet (DC2) to regularly check on DC's condition at two-hourly intervals. The chairs in the cabin were removed and an additional comforter was placed on the floor to provide a padding, in the event DC were to roll over from the bed.
- 1.1.19 On 25 November 2022, at about 0700H, the Master inquired from the DC2 on the condition of the DC and was told that the DC had been sleeping in his bed

¹⁴ Singapore flagged ships are required to carry out a list of medicines according to the First schedule under the Merchant Shipping (Medical Stores) Regulations. An annual inspection by a registered pharmacist is required. The last such inspection was done in Shanghai on 23 February 2022.

¹⁵ There was no evidence to indicate that this was given to the DC.

¹⁶ About six inches in diameter and three inches in depth.

through the night¹⁷. At about 0800H, the Master received a call from the DC2 that the DC was in a bad condition. The Master called the CO and went to the DC's cabin to check his specific condition. The Master observed that the DC was lying on the bed on his right-hand side facing the bulkhead of the cabin, with his feet bent inwards and palms clasped. The Master called out to the DC but did not receive reply. On touching the DC, the Master felt the body was cold and stiff. There was no airflow from his nose or mouth.

- 1.1.20 The CO came to the DC's cabin and both the Master and the CO carried the DC to the floor. They both recalled noticing that there was some fluid on the DC's face (on the right-hand side) and his hair. The foreign matter was cleaned, and airway opened with subsequent CPR being performed. After about 30 minutes, the Master assessed that the DC did not present any vital signs and reported to the Company accordingly. Measures to preserve the body were initiated by the Master in accordance with established procedures.

1.2 The ship

- 1.2.1 Bao Success is a bulk carrier with five cargo holds. At the time of the incident, she was partially loaded and carrying about 46000 MT of Nickel Ore in bulk in all cargo holds loaded from San Pedro, Ivory Coast on 8 November 2022. No. 5 cargo hold was loaded to about 47% with about 9778 MT of Nickel Ore (see figure 1).

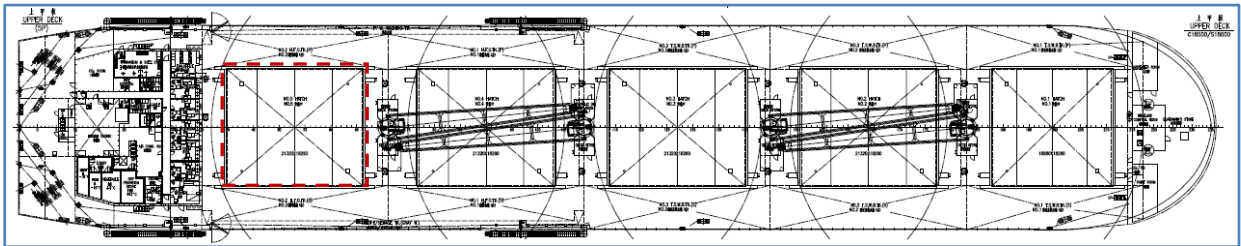


Figure 1 – Plan view of Bao Success – red dashed line indicates no. 5 cargo hold (Source: The Company – annotated by the TSIB).

¹⁷ This was based on a check by the deck cadet by opening the cabin door and noticing the DC in his bed. There was no check of his actual condition.

1.2.2 The vessel has 6 bunker tanks namely No. 1 HFO tank (Port & Starboard), No. 2 HFO tank (Port & Starboard) and No. 3 HFO tank (Port & Starboard). No. 3 HFO tanks are located closer to the accommodation. No.1 HFO tanks are in line with No. 4 cargo hold while No. 2 HFO tanks are in line with No. 5 cargo hold (see **figure 2**). At the time of the incident the vessel had about 520 MT of fuel oil, of which 170 MT was inside No. 2 HFO tank (Port).

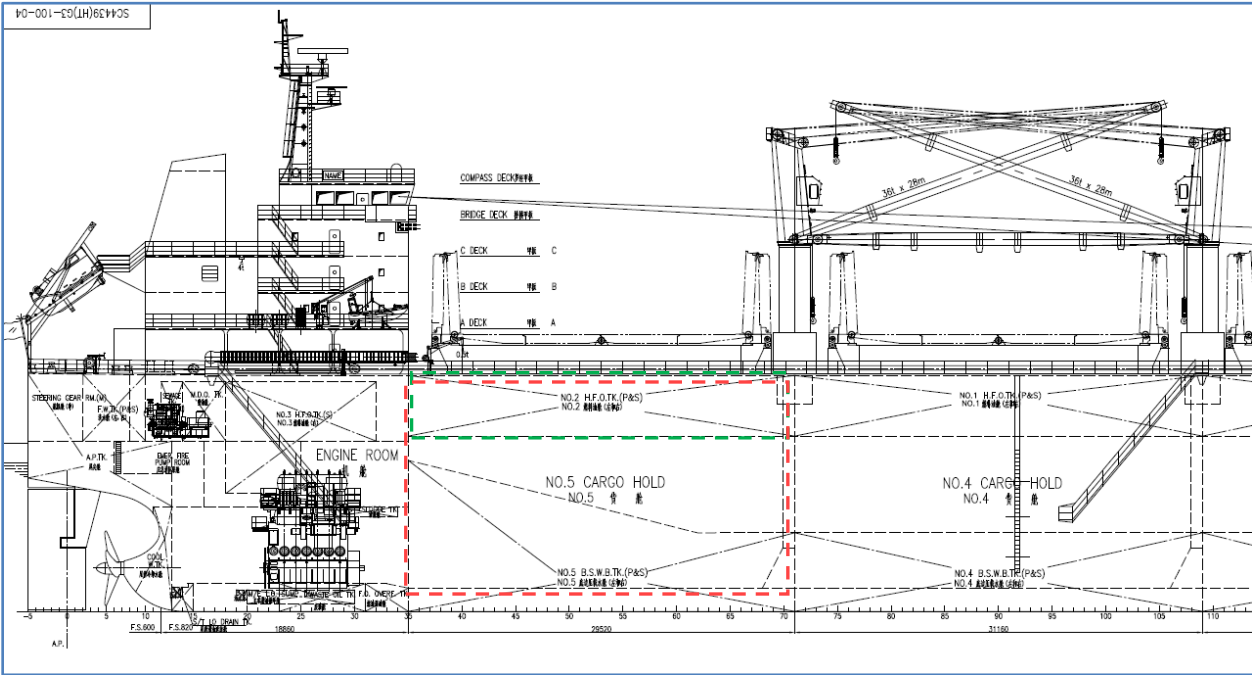


Figure 2 – Partial profile view of Bao Success – green dashed line indicates no. 2 HFO tank (as viewed from starboard side) (Source: The Company – annotated by the TSIB)

1.2.3 No. 2 HFO tank (Port), like most bunker tanks, has two vents to release vapour when fuel is loaded into the tank. The vents are about one metre in height and have a tray (typically referred to as a drip tray) to collect any small spills due to oil overflow from the tank (see **figure 3**).



Figure 3 – View of the forward vent for No.2 HFO tank (Port) - (Source: The Company)

- 1.2.4 It is normal for vapour or fumes to be emitted from such vents, especially when the tank is being heated. According to the Chief Engineer the fuel tank temperature was normally maintained at about 45 degrees Celsius. No. 2 HFO tank (Port) contained low Sulphur fuel (0.49% of Sulphur content) which was taken at a port from Luanda, Angola (Africa).
- 1.2.5 According to the Safety Data Sheet (SDS), the Threshold Limit Value 8H Time Weighted Average for HFO is about 300 minutes. Respiratory controls included the use of protective mask. The first aid measures indicate -
- INHALATION - If breathing is stopped to administer artificial respiration
 - LUNG ASPIRATION – Seek medical advice immediately (Narcotic in very high concentration)
- 1.2.6 According to the SDS, protective mask is recommended for respiratory protection. At the time of the occurrence, the DC was not wearing any respiratory protection while assisting the Fitter from outside the cargo hold.
- 1.2.7 The vessel carried a list of publications as prescribed by the flag Administration, which included but not limited to a complete up-to-date list of radio stations and list of coast earth stations through which radio medical advice can be obtained. The vessel had the third edition of the International Medical Guide for Ships, as amended, at the time of the occurrence.

1.3 The crew

1.3.1 There were 24 crew of single nationality (Chinese) onboard. All crew held valid STCW¹⁸ competency certificates required for their respective positions onboard, and the working language was Chinese.

1.3.2 The qualification and experience of the Master, relevant officers and crew are tabulated in the table 1 below.

Designation onboard	Age	Qualification	Duration onboard (month)	In rank service (Year)	Service in Company (Year)	Working schedule onboard
Master	39	COC – Master / STCW II/2, IV/2, MSA China	4	4.8	10	N/A
Chief Officer	36	COC – Chief Officer / STCW II/2, IV/2, MSA China	5.5	4.6	12	1200-1600 0000 - 0400
DC	34	Wuhan Institute of Shipbuilding Technology	3	0.32	First ship	0830-1730 (Dayworker)
DC2	24	Jiangsu Maritime Institute	4	0.42	First ship	0830-1730 (Dayworker)
Chief Cook	50	Nantong Shipping college	4	6.9	6	0600-1200 1600-1800

Table 1

1.3.3 The Master and the CO had undergone a training on Shipboard Medical Care under STCW VI/4 in January 2014 and February 2018 respectively, by an institution approved by the Marine Safety Administration (MSA), China.

1.3.4 According to a Medical Examination Certificate issued to the DC on 10 November 2021 by a medical institution approved by the MSA, China for seafarers' medical check-up, the DC was certified medically fit for duty onboard ship. The certificate issued was valid for two years, without any limitations or restrictions on fitness, and indicated that the DC had passed hearing and eyesight tests in accordance with the STCW Code¹⁹. A pre-employment

¹⁸ The International Convention on Standards of Training, Certification and Watch keeping for Seafarers (or STCW), 1978 sets qualification standards for masters, officers and watch personnel on seagoing merchant ships. STCW Code, A-1/9 which defines the standards of medical fitness for seafarers.

medical examination dated 15 July 2022 indicated that other than a mild fatty liver, the DC did not have any pre-existing health issues.

1.3.5 This being DC's first ship, he had primarily been assigned minor maintenance work (typically assigned to cadets on most ships) and assistance for other senior crew, in accordance with the job scope identified in the SMS, which was a typical arrangement on most ships. Prior to the incident, the DC had performed the following work / rest –

- Watchkeeping in port from 1 Nov to 8 November 2022
- Washing the main deck on 9 November 2022
- De-rusting and painting on main deck from 10 November 2022 to 11 November 2022.
- Assist the fitter for repair work on 12 November 2022
- Rest in cabin from 13 November 2022 till 25 November 2022

1.3.6 According to the vessel's work/rest hour records, in the past 24-hour prior to the occurrence, the DC had 16 hours of rest and in the last 7-day period, he had 130 hours of rest, indicating compliance with the STCW and Maritime Labour Convention's (MLC) requirements concerning the hours of work and rest²⁰.

1.3.7 The DC had undergone a familiarisation training in accordance with the Company's SMS procedures for new joiners. This training primarily was for emergency duties (within 24 hours) and some shipboard operations²¹ to be completed within one week of joining, which were duly documented. There was no specific familiarisation training for cadets / trainees who were on their first ship on the risks associated with shipboard operations.

1.4 **The safety management system**

1.4.1 The Company managed Bulk Carriers. A full-term Document of Compliance certificate was issued to the Company by Bureau Veritas on 16 October 2019

²⁰ STCW Chapter VIII and MLC, Reg 2.3 with regards to rest hour - Minimum hours of rest shall not be less than i) ten hours in any 24-hour period; and ii) 77 hours in any seven-day period. Hours of rest may be divided into no more than two periods, one of which shall be at least six hours in length, and the interval between consecutive periods of rest shall not exceed 14 hours.

²¹ Such as operation and maintenance of machinery, garbage disposal rules, reporting procedures for accidents among others.

based on an audit completed on the same date and it was valid until 21 October 2024. The last verification (annual) audit for this issuance was carried out on 15 August 2022.

- 1.4.2 A full-term Safety Management certificate was also issued by Bureau Veritas to Bao Success on 7 June 2019, based on an audit completed on the same date and was valid until 3 August 2024. The last intermediate verification was conducted on 24 May 2022.
- 1.4.3 According to the Company's Safety Management System (SMS) procedures *Instructions for crew related emergency*, when there is an emergency related to shipboard personnel, the crewing department is to contact relevant parties, such as medical institutions and related government departments to provide necessary support for the crew.
- 1.4.4 In the event of a serious injury, serious illness or an emergency (involving the crew) the Master is required to organise personnel perform rescue and take care of the patient according to the International Medical Guide for Ships (IMGS). Depending on the ship's location and state of illness of the crew, medical advice or support should be requested. In an emergency the nearest port authority, or maritime search and rescue centre should be notified, or the Company updated, to arrange for a port of call or emergency medical rescue (evacuation).
- 1.4.5 On receipt of the report of a crew injury, the crewing department is to rapidly consult professional medical institutions and guide the ship to perform necessary medical treatment. The department is to assist the ship to communicate with the agent, relevant port authorities (where the vessel is) to request for help and report to General Manager for further instruction.
- 1.4.6 According to the SMS *Shipboard Medical Instructions* – the crewing department is responsible to furnish the ships with various medicines, necessary medical apparatus (as per maritime legislation relating to safety at sea), provide necessary relevant support²², handle ship's medicine chest certificate. The Master is fully responsible for the management of medical affairs²³ onboard

²² Medical care and health protection services while a seafarer is onboard ship or landed in a foreign port is provided by the Company free of charge to seafarers.

²³ The training in medical care meets the requirements of the STCW Convention, as amended, including practical training and training in life-saving techniques such as intravenous therapy, which will enable the persons concerned to participate effectively in coordinated schemes for medical assistance to ships at sea, and to provide the sick or injured with a satisfactory standard of medical care during the period they are likely to remain onboard (Source: SMS).

and the CO, having received relevant training to deal with management²⁴ of medicines is to oversee the medical treatment for crew members.

- 1.4.7 Ships are to be equipped with medicine chest approved by the flag Administration, regarding the amount and type of medicines, medical equipment. The SMS stated that all ships in the fleet carry the IMGS, as amended, the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods, as amended and the medical section of the International Code of Signals, as amended.
- 1.4.8 The SMS stated that in cases where it is considered necessary to provide shore medical services²⁵, a medical report form (for use by relevant onshore and onboard medical personnel when medical advice is sought for the seafarer) be completed and sent to the crewing department. The Master should not hesitate to ask for advice even in cases which appear to be simple and, if necessary, assistance by radio from the nearest ship with a doctor onboard or from medical authorities ashore through the nearest coastal radio station²⁶ should be sought.
- 1.4.9 According to the Company, the crewing manager informed the General Manager on 18 November 2022. A medical form was submitted by the Master to the crewing manager, which the investigation team noted was created on 25 November 2022.. There was also no record of any communication between the vessel and a coastal radio station.
- 1.4.10 All officers and crew had, according to the Company, a proper understanding of its SMS requirements.
- 1.4.11 After the incident, a Flag State Control inspection was conducted on the vessel on 13 December 2022. The vessel was issued with 33 deficiencies (of which two were detainable) and the vessel was detained²⁷. Prior to the incident the vessel had been detained²⁸ in Italy after a Port State Control Inspection on 10 February 2022, and the vessel was also issued with 26 deficiencies, which

²⁴ The CO is in charge of keeping records and ordering medical supplies, organising the medicine chest.

²⁵ Serious cases of accident and injury onboard are referred to International Radio Medical Centers (CIRM) for advice and assistance.

²⁶ In case of language difficulties, the Master should use coded messages. The International Code of Signals has a special Medical Section for this particular purpose, which gives details of all countries, which provide medical advice by radio. Messages can be transmitted by radiotelegraphy or radiotelephone.

²⁷ The deficiencies found were objective evidence of a serious failure and lack of effectiveness on the implementation of the ISM Code.

²⁸ The deficiencies found were objective evidence of a serious failure and lack of effectiveness, of implementation of the ISM Code.

were rectified. Subsequently additional ISM audit(s)²⁹ and additional survey was imposed by the Administration to be completed within three months.

1.5 The medicine chest and medical advice

1.5.1 The vessel’s medicine chest is required to be in accordance with the flag Administration’s requirements³⁰. The annual inspection was done on 23 February 2022 by a registered pharmacist in Shanghai, China. Most of the medicines contained in the accompanying list were listed in Chinese and with Hanyu Pinyin³¹ (see **figure 4**).

4.	三七伤药片 SANQISHANGYAOPIAN	盒	10	2024. 11	药房 4	内服药
5.	吗丁啉 MADINGLIN	盒	5	2023. 05	药房 4	内服药
6.	复方黄连素片 FUFANGHUANGLIANSUPIAN	盒	5	2025. 01	药房 4	内服药
7.	云南白药胶囊 YUNNANBAIYAOJIAONANG	盒	2 7	2023. 10 2026. 10	药房 4	内服药

Figure 4 – Sample extract of medicines maintained on the vessel with the “translated names in English (Source: The Company)

1.5.2 The list did not contain the medicine suggested by the Dr. in the communication with the crewing manager on 24 November 2022. The vessel had two sets of medical grade oxygen with flow meter in the list which was kept in the vessel’s hospital (infirmary). The infirmary was provided with various equipment needed for Shipboard Medical Care.

1.5.3 The investigation team consulted a medical practitioner³² (MP) in Singapore, approved by the flag Administration, on whether the medical advice provided for the care of the DC was appropriate and what other actions could have been taken onboard pending the sign-off of the DC for medical attention ashore.

1.5.4 The MP advised that exposure to gas such as that from HFO for a prolonged

²⁹ On the vessel and the Company.

³⁰ Merchant Shipping (Maritime Labour Convention) – Medicines and Medical Equipment Regulations 2014 – Scale A set out in Part 1 of the First Schedule for Foreign-going Singapore ships.

³¹ Romanisation of Chinese characters based on their pronunciation.

³² With prior experience in providing radio medical advice.

- period may result in Central Nervous System Depression. However, since the DC's exposure was likely not prolonged, this was unlikely. Regardless, moving the person to fresh air immediately after being suspected of gas inhalation would be one of the first steps. Thereafter, ensuring airway is always clear, and administering medical grade oxygen would be the most appropriate step to be taken.
- 1.5.5 The MP also indicated that diarrhoea would result in loss of body fluids causing a person to be dehydrated. When a person is dehydrated, if the salts in the body are not adequately replaced, this could result in persons entering an altered mental state (may pass out). When such a situation takes place, any gag reflex experienced to throw up the stomach contents (of ingested food) may not be achieved, and the contents may enter the lungs causing aspiration.
- 1.5.6 The MP further added that to determine whether a person remains hydrated, it is important to monitor the vital signs of the person which includes checking the pulse, the blood pressure and temperature. A high pulse and a low blood pressure can be indicative of the person suffering from dehydration. A high temperature indicates some sort of infection in the body. The investigation team noted that during the period the DC's condition was monitored, only the temperature was checked, which was within normal range.
- 1.5.7 According to the MP, monitoring a dehydrated person should be followed by administering oral rehydration salts or providing saline via an intravenous drip. The above are a part of training under Shipboard Medical Care under STCW VI/4.
- 1.5.8 The MP also noted that although Omeprazole was prescribed by the Dr., the medication is specifically to treat gastritis, which did not appear to be in the case of the DC.
- 1.6 **IMGS**
- 1.6.1 The IMGS did not specifically address inhalation of HFO vapour. In the event of poisoning from common gases or vapours, the IMGS recommends for the person to –
- leave the danger zone at once and get into the open.
 - while escaping, cover the nose and mouth with a wet cloth, if possible.

- If irritation is felt in the eyes or throat, to hold the breath and to keep the eyes closed as much as possible while escaping.
- 1.6.2 If a crew member has been exposed to a toxic gas or vapour, to put on rubber gloves and remove the crew member's clothing and seal it in a plastic bag. To have the crew member shower, washing all over with soap for 15 minutes, then rinse the eyes with water for 10 minutes.
- 1.6.3 According to the IMGS, carbon monoxide poisoning can occur if a person inhales smoke from a large fire or from poorly ventilated internal combustion engines, fuel stoves and heaters. Signs and symptoms of mild cases include headache, feeling unwell, nausea and dizziness. Severe cases can lead to confusion, drowsiness and loss of consciousness.
- 1.6.4 Smoke inhalation, according to the IMGS is toxic because it contains carbon monoxide and often hydrogen cyanide as well as other combustion products that are toxic to the lungs. The treatment for such a situation requires oxygen to be administered using an oxygen mask with a high flow rate. Removal of carbon monoxide from the blood may require administration of oxygen for 24 hours or until the oxygen runs out.
- 1.7 **Cause of death**
- 1.7.1 An autopsy conducted on 30 November 2022 in Mauritius determined the cause of death to be Asphyxia due to aspiration of stomach content.
- 1.8 **Vessel's passage and environmental condition**
- 1.8.1 At the time of occurrence, the vessel was on a south easterly heading on the west coast of Africa. The ship's logbook indicated that there was southern easterly wind blowing at about 20-25 knots (Beaufort wind force 4), the sea condition was moderate.
- 1.8.2 From the 13 November till 24 November 2022, the vessel passed³³ by the following countries off the coast of Africa – Angola³⁴, Namibia³⁵, South Africa³⁶

³³ Outside the Exclusive Economic Zone

³⁴ E.g. Luanda and offshore oil terminals such as Cabinda, Canuku, Dalia, Essungo, Futila, Girassol, Greater Plutonio.

³⁵ Luderitz, Walvis Bay

³⁶ E.g. Cape Town, Durban, Richards Bay, Saldanha Bay.

and Madagascar³⁷. The relevant ports where medical facilities are available are:

- (a) Angola
 - Luanda – It is the capital and principal port of Angola and has medical facilities.
- (b) Namibia
 - Walvis Bay – It is the primary port of Namibia and has medical facilities located in the town centre.
- (c) South Africa
 - Cape Town – A well-known port on the southwest coast. Has medical facilities including helicopter capabilities for off port storing and crew change including medical evacuation which extends to 200nm. There are no difficulties for personnel disembarking due to medical reasons.
- (d) Durban
 - Launch services are available to attend to vessels off port limits (four nm from the breakwater). Helicopter services are available, and consuls of the Republic of the Philippines is available for assistance if needed.

1.8.3 The was no evidence available to the investigation team on the reasons for the Master not to seek any medical advice (for the DC) between the period 13-18 November 2022 or consider by proceeding to any of the other ports. The Company confirmed they were only aware of the condition on 18 November 2022, after which attempts were made to disembark the DC at the earliest opportunity while seeking medica advice.

³⁷ Has small ports with some basic medical facilities.

2 ANALYSIS

2.1 This is an unfortunate incident that resulted in the death of a young and inexperienced crew member. The DC was reported to start feeling unwell after inhaling fumes from the No. 2 HFO tank Port while assisting the Fitter. The cause of death of the DC was determined to be Asphyxia due to aspiration of stomach. Although the DC was given light duties, soft diet and efforts were taken to care for him subsequently, the investigation team took the following into consideration when analysing whether the incident could have been prevented and if improvements could be made to alleviate the situation:

- (a) Precaution taken to avoid the inhalation of HFO fumes
- (b) Medical care onboard Bao Success
- (c) Deviation from the voyage to seek medical attention

2.2 Precaution taken to avoid the inhalation of HFO fumes

2.2.1 Fumes from HFO tanks onboard ships are quite common. The vent for the HFO tank onboard this vessel was on the main deck and not in a confined space. Most seafarers when encountering fumes, would typically move away from the location to minimise the exposure. If work is being carried out in the vicinity, then a respiratory mask would minimise the possibility of inhalation.

2.2.2 The DC had been onboard for three months and this was his first ship. Like most ships the DC was assigned to work with senior crew, such as the Fitter in this case. However, there was no evidence to suggest that the Fitter advised the DC to stay clear from the fumes when assisting him from the main deck or to wear a respiratory mask should the presence of the DC be needed from the location.

2.2.3 It is likely that the lack of such an advice and the DC's limited experience at sea, did not allow the DC to understand the risks associated with inhaling the fumes from HFO. Although the DC had undergone a familiarisation in accordance with the Company's SMS, there were no specific DOs and DON'Ts in the checklist that could increase the DC's awareness on the risks associated with shipboard operations such as inhalation of fumes, which may appear less harmful.

2.3 **Medical care onboard Bao Success**

- 2.3.1 When the Master became aware on 13 November that the DC had inhaled some fumes / vapours from the No. 2 HFO tank Port while working with the Fitter on deck, the DC was given rest, soft diet and care was taken including laying padding on the floor of the DC's cabin to prevent injury should the DC suffer a fall due to bad weather.
- 2.3.2 The vessel was equipped with facilities for Shipboard Medical Care by officers who had been trained under STCW VI/4, i.e. the Master and the CO. The CO was responsible for medical treatment for crew members according to the SMS and the Master was required to ensure such a care was provided for.
- 2.3.3 However, when the DC was suspected of having inhaled some vapours from the HFO tank, he was not shifted to the shipboard infirmary and was not administered oxygen. Monitoring of his vital signs was limited to taking his temperature which was within normal range.
- 2.3.4 The DC was asked to rest in his cabin and take fresh air twice daily and also participated in emergency drills. This was likely on the assumption that his symptoms were mistaken to be a result of seasickness (the vessel was experiencing bad weather). Efforts to encourage the DC to have food remained largely unsuccessful.
- 2.3.5 Both the Master and the CO had undergone training on Shipboard Medical Care in 2014 and 2018 respectively. It was evident that the knowledge gained in this training had not been applied to provide medical care to the DC as expected.
- 2.3.6 The Company's SMS also provided information to manage medical situations, such as seeking guidance from the IMGS as well as radio medical advice. There was no evidence of such an advice being sought, except seeking the opinion of a Company Dr. using the WeChat communication. The investigation team noted that although the crewing manager informed the General Manager on 18 November 2022, the form provided to the investigation team may have been created after the occurrence. In the absence of such a form that provides details of the medical condition, there is doubt on the level of medical intervention that was possible in treating the DC.
- 2.3.7 Despite the Company's SMS providing guidance to manage medical situations,

it is also highly likely that there was a lack of understanding of the SMS requirements by the Master and the CO who solely relied on the advice of the crewing manager, who in turn was communicating the instructions of the Company Dr.

- 2.3.8 The Company Dr. had rightly identified the need for the DC to be hydrated in the early stages of providing the advice, given the earlier symptoms of vomiting and diarrhoea being communicated. However, in the absence of details like the pulse, blood pressure, it would have been difficult for the Company Dr. to provide proper medical consultation. Notwithstanding, the investigation team was not able to determine the reasons why the Company Dr. did not advise the crew to administer oxygen to the DC.
- 2.3.9 Noting that the DC had passed very little urine (and was yellow in colour), the investigation team also opined that although the DC had eaten some food, he was likely dehydrated over a period of time and remained in such a condition till his passing.
- 2.3.10 As opined by the MP, in a dehydrated state, there is a possibility for any gag reflux from the stomach contents to enter the lungs as the individual may pass out while lying down. This was consistent with the findings in the autopsy report.
- 2.3.11 It would have been prudent for the CO (being the medical care officer onboard) to take an active role in ensuring the DC's condition to be monitored and for the Master to ensure that the outcome was communicated to the Company Dr. while seeking radio medical advice from CIRM or equivalent facilities from the nearest coast radio station instead of assuming the cadet was seasick.

2.4 **Deviation of voyage to seek medical attention**

- 2.4.1 The Company became aware on 18 November that the condition of the DC had deteriorated five days after the DC had first reported to be unwell. During this period, the vessel had an opportunity to call any of the ports that were enroute to Mauritius. The investigation team noted that the intention to sign-off the DC in Mauritius was made after 24 November 2022 (one day prior to the DC's passing) and to divert the vessel to Madagascar for medical attention.
- 2.4.2 The reasons for the Master to not consider deviating to any of the other ports when the DC was first reported to be unwell, where medical facilities were

available could not be established. It is possible that the Master's decision was affected by the condition of the DC which did not appear life-threatening and an assumption that the DC being at sea on his first ship was likely feeling seasick.

2.4.3 It is also likely that the Master had been over reliant on the advice of the crewing manager in managing the situation instead of exploring options available to ensure medical attention is given to the DC.

2.4.4 This incident highlighted the importance of ensuring that medical care for crew members should be given utmost priority and efforts must be taken to expedite it.

3 CONCLUSIONS

From the information gathered, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- 3.1 When the DC was assisting the Fitter from the main deck to perform some work inside the cargo hold, he inhaled some fumes from the HFO tank vent in the vicinity. The DC did not wear any respiratory mask for the duration he was assisting the Fitter, and the inhalation caused the DC to feel unwell.
- 3.2 The DC being inexperienced, likely had a limited awareness of the risks associated with inhalation of HFO fumes and had not been warned / guided by senior crew under whose supervision he was assisting.
- 3.3 Following the inhalation, the DC was given rest in his cabin and administered a light diet. During this period, the DC experienced diarrhoea and vomiting. The DC's vital signs were not monitored, and he was not administered medical oxygen.
- 3.4 The Master and the CO did not put their training on Shipboard Medical Care in practice and relied on the advice received by the crewing manager.
- 3.5 Although the Company sought advice from their doctor, there was no evidence to suggest that radio medical advice from a coast radio station was sought in accordance with the Company's SMS procedures.
- 3.6 The DC's condition was mistaken to be as seasickness and the Master did not consider deviating earlier in the voyage, so that the DC could receive prompt medical attention.

4 SAFETY ACTIONS

During the course of the investigation and through discussions with the investigation team, the following safety actions were initiated by the relevant stakeholders.

- 4.1 The Company's investigation concluded that before arranging new crew members to work on the ship, training is to be enhanced to introduce their work and life on the ship to improve the familiarity of shipboard operations.
- 4.2 For newly joined persons, safety awareness (personal responsibilities and requirements) of work should be established onboard as soon as possible.

5 SAFETY RECOMMENDATIONS

A safety recommendation is for the purpose of preventive action and shall in no case create a presumption of blame or liability.

5.1 For the Company

5.1.1 To conduct training for crew joining ship for the first time to raise their awareness of the DOs and DONTs on shipboard work life before them being sent onboard ship. **[TSIB Recommendation RM-2023-07]**

5.1.2 To ensure officers are familiar with the requirements of providing Medical Care onboard ship. **[TSIB Recommendation RM-2023-08]**

5.1.3 To establish clear procedures for seeking radio medical advice from a coast radio station and cater for deviation without delay, should such a need arise. **[TSIB Recommendation RM-2023-09]**